A. G. Contract No. KR94 1250TRN

ECS File No.: 94-98

Project: IVH-9404(601)/H3856 01X Section: IVHS Early Deployment

INTERGOVERNMENTAL AGREEMENT

BETWEEN

THE STATE OF ARIZONA

AND

MARICOPA COUNTY, ARIZONA

I. RECITALS

- 1. The State is empowered by Arizona Revised Statutes Section 28-108 and 28-112 to enter into this agreement and has by resolution, a copy of which is attached hereto and made a part hereof, resolved to enter into this agreement and has delegated to the undersigned the authority to execute this agreement on behalf of the State.
- 2. The County is empowered by Arizona Revised Statutes Section 11-251 to enter into this agreement and has by resolution, a copy of which is attached hereto and made a part hereof, resolved to enter into this agreement and has authorized the undersigned to execute this agreement on behalf of the County.
- 3. The State and the County desire to participate in the development a region-wide strategic plan for the early deployment of the Intelligent Vehicle Highway System technology in Maricopa County. The FHWA has funded \$400,000.00 towards this effort, to be accomplished in accordance with the attached Scope of Work, hereinafter referred to as the Project.

THEREFORE, in consideration of the mutual agreements expressed herein, it is agreed as follows:

NO. 18906
FILED WITH SECRETARY OF STATE
Date Filed 09/12/94

12: Land Hahorey
Secretary of State

By LICKY Orsene word

II. SCOPE

1. The County will:

- a. Be the lead agency for the Project. Coordinate as necessary with the the Federal Highway Administration, the State, the Maricopa Association of Governments and other local jurisdictions. Hire consultants as required, and accomplish the objectives of the Project as shown in the Scope of Work, which is attached hereto and made a part hereof. Comply with applicable procurement laws, rules and regulations. Be responsible for any consultant claims for extra compensation attributable to the County.
- Identify and document applicable IVHS user b. services; establish system performance criteria, assess the functions and requirements of the system; identify and evaluate technologies on the basis of performance. potential compatibility, flexibility and cost; assess potential funding and implementation options; and identify time frames for implementation.
- c. Provide the in-kind match requirements of the grant generally in accordance with Exhibit A, which is attached hereto and made a part hereof, and provide the State, the FHWA and Project coalition members with copies of progress reports, related data as appropriate, and a final report.
- d. No more often than monthly, invoice the State on a cost reimbursement basis, in a total amount not to exceed \$400,000.00.

2. The State will:

- a. Review progress reports and other data and provide comments as appropriate.
- b. Reimburse the County within thirty (30) days after receipt of invoices, in a total amount not to exceed \$400,000.00. Be responsible for any consultant claims for extra compensation attributable to the State.

III. MISCELLANEOUS PROVISIONS

1. This agreement shall remain in force and effect until completion of said Project and reimbursements; provided, however, that this agreement may be cancelled at any time prior to the commencement of performance under this agreement, upon thirty (30) days written notice to the other party.

JPA 94-98

- 2. This agreement shall become effective upon filing with the Secretary of State.
- 3. This agreement may be cancelled in accordance with Arizona Revised Statutes Section 38-511.
- 4. The provisions of Arizona Revised Statutes Section 35-214 are applicable to this contract.
- 5. In the event of any controversy which may arise out of this agreement, the parties hereto agree to abide by required arbitration as is set forth in Arizona Revised Statutes Section 12-1518.
- 6. All notices or demands upon any party to this agreement shall be in writing and shall be delivered in person or sent by mail addressed as follows:

Arizona Department of Transportation Joint Project Administration 205 South 17 Avenue, Mail Drop 616E Phoenix, AZ 85007

Maricopa County Assoc. County Administrator for Operations 2901 West Durango Street Phoenix, AZ 85009

7. Attached hereto and incorporated herein is the written determination of each party's legal counsel that the parties are authorized under the laws of this state to enter into this agreement and that the agreement is in proper form.

IN WITNESS WHEREOF, the parties have executed this agreement the day and year first above written.

MARICOPA COUNTY, ARIZONA

STATE OF ARIZONA

Department of Transportation

BETSY BAYLESS, Onairman Board of Supervisors HARRY A. REED, Director Transportation Planning Division

ATTEST

By Macappoin

FRAN McCARROLL Clerk of the Board

RESOLUTION

BE IT RESOLVED on this 3rd day of May 1994, that I, the undersigned LARRY S. BONINE, as Director of the Arizona Department of Transportation, have determined that it is in the best interests of the State of Arizona that the Department of Transportation, acting by and through the Transportation Planning Division, to enter into an agreement with Maricopa County for the purpose of defining responsibilities for the development of the Intelligent Vehicle Highway System technology early deployment project.

Therefore, authorization is hereby granted to draft said agreement which, upon completion, shall be submitted for approval and execution by the Director, Transportation Planning Division.

DR' LARRY S. BONINE

Director

COUNTY OF MARICOPA

State of Arizona

Office of the Clerk

State of Arizona) ss
County of Maricopa) "

I, Fran McCarroll, Clerk of the Board of Supervisors do hereby Certify that the attached is a true and correct excerpt from the minutes of the meeting of the Board of Supervisors held August 5, 1994:

INTERGOVERNMENTAL AGREEMENT WITH THE ARIZONA DEPARTMENT OF TRANSPORTATION FOR DEVELOPMENT OF A REGION-WIDE STRATEGIC PLAN - APPROVED

Bob Gagen, Director, Facilities Management, amended the recommendation as noted to delete "HURF".

Recommendation was made to approve an Intergovernmental Agreement with the Arizona Department of Transportation (ADOT) in order to secure federal funding for the development of a region-wide strategic plan for the early deployment of the Intelligent Vehicle Highway System (IVHS) in Maricopa County. The \$400,000 Federal Grant (HURF) from the Federal Highway Administration requires \$100,000 in an in-kind match from the County. (CS951034) (TD14594)

Motion was made by Supervisor Wilcox, seconded by Supervisor King, and unanimously carried to approve the recommendation as amended.



IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Official Seal of the Board of Supervisors. Done at Phoenix, the County Seat, on the following day:

August 23, 1994

Clerk of the Board of Supervisors

JPA 94-98

APPROVAL OF THE MARICOPA COUNTY ATTORNEY

I have reviewed the above referenced proposed intergovernmental agreement between the STATE OF ARIZONA, acting through the DEPARTMENT OF TRANSPORTATION and MARICOPA COUNTY, and declare this agreement to be in proper form and within the powers and authority granted to the County under the laws of the State of Arizona.

INTELLIGENT VEHICLE HIGHWAYS SYSTEM STRATEGIC PLAN ESTIMATED SOFT MATCH

1.	Staff salaries:	
	Direct Labor	\$35,891
	Overhead @ 138%	49,530
	Total	\$85,422
2.	Committee Salaries:	
	Steering (12 mtg)X(12 persons)X(2.0 hrs)X(\$25.	avg)=\$ 7,200
	Tech Work Groups: $(10)X(3)X(2)X($20.)=$	1,200
	Overhead @ 120%	10,080
	Total	\$18,480
3.	Facilities & Equipment:	
	46 meetings X \$50.00 per	\$ 2,300
4.	Summary:	
	MCDOT Staff	\$85,422
	Committees	18,480
	Facilities	2,300
	Total	\$106,200
	Call	\$106,000

MARICOPA COUNTY

DEPARTMENT OF TRANSPORTATION

SCOPE OF WORK

FOR THE DEVELOPMENT OF A

STRATEGIC PLAN

FOR THE EARLY DEPLOYMENT OF

INTELLIGENT VEHICLE HIGHWAY SYSTEM TECHNOLOGIES



JANUARY 21, 1994
TRANSPORTATION PLANNING DIVISION

INTRODUCTION

On May 7, 1993 Maricopa County Department of Transportation (MCDOT) submitted a Letter of Interest, on behalf of the incorporated and unincorporated areas of Maricopa County, to apply for federal assistance to conduct a planning study for the early deployment of Intelligent Vehicle Highway System (IVHS) technologies. Since that submittal, the Federal Highway Administration (FHWA) recommended that funds for the Phoenix region Early Deployment Program be allocated during Fiscal Year (FY) 1994. Prior to receiving these funds, FHWA requested that Maricopa County develop a detailed scope of work outlining tasks that will be undertaken during the planning study. This is the proposed scope of work to be utilized to solicit qualified consultants to prepare the strategic deployment plan. Utilizing a coalition of local agencies formed during earlier projects, it is envisioned that a strategic plan for the early deployment of IVHS technologies would be produced reflecting area-wide transportation goals and objectives. It is estimated the process will take 12 months.

BACKGROUND INFORMATION

The Phoenix metropolitan area has grown over the past 20 years, during which time the region evolved from a group of separate small communities surrounding the City of Phoenix, into a large, continuous, interrelated metroplex rated as the seventh most populous in the United States. With this growth, the street network serving these communities has expanded into an arterial street system that provides inter-city routes for travel within the region.

The geographic, demographic, and political setting of the County are unique. Located in the predominantly flat Sonoran desert valley of the southwest, Maricopa County encompasses 9,226 square miles. Approximately 570 square miles were developed into an urban core comprising 24 municipalities, which include the cities of Phoenix, Mesa, Tempe, Scottsdale, Glendale, and Chandler.

Among the fastest growing metropolitan areas in the United States, Maricopa County is second only to Orlando, Florida in population growth. Maricopa County is emerging as the main population, trade, and service center of the southwest. Massive federal and private projects provided Maricopa County with ample energy and water to accommodate growth for years to come. Additionally, improved transportation facilities and continued airport expansion have increased accessibility to major cities throughout the U.S., Canada, Mexico, and the Pacific Rim.

Presently, over two million people reside in the urban area of the County in 24 municipalities, three Native American Communities, one Air Force Base, and several large unincorporated retirement communities. The Phoenix metropolitan area grew by 40.6% between 1980 and 1990. The Phoenix metropolitan population will increase by approximately 600,000 people during the next ten years (the number now living in Tempe, Mesa, and Chandler). Over the next ten years, the County is expected to continue as one of the fastest growing population centers in the nation. Employment opportunities are expected to exceed population growth during the 1990-2000 period.

Maricopa County attracts a population typified as well educated, with relatively high incomes (averaging \$31,000 annually). Attraction to the region is due, in part, to the presence of three universities, 15 colleges, and many private schools specializing in advanced technology.

Geographic, demographic, and political features suggest that IVHS applications must be integrated to meet the region's unique transportation needs and provide user benefits. Rapid population growth and transportation system requirements mandate the consideration of innovative strategies, including IVHS, to meet future demands.

This southwest desert community is characterized by the presence of high technology employers and a cyclical influx of winter tourists. This creates an ideal demand and good test-bed for IVHS communications infrastructure. IVHS infrastructure should withstand high temperatures and be swiftly deployed concurrent with the growth pattern. The strategic plan for deployment should yield a wide array of personalized IVHS services including individualized traveler information and route guidance.

INFRASTRUCTURE AND MANAGEMENT

The Maricopa Association of Governments (MAG) is a voluntary association of municipal governments within Maricopa County. MAG is the regional Metropolitan Planning Organization (MPO) and administers the distribution of federal aid funds received through the federal Intermodal Surface Transportation Efficiency Act (ISTEA) legislation. The MAG Transportation Planning Office (MAGTPO) is staffed by County employees and is located in the MCDOT facility.

While the MAG transportation planning function operates efficiently in planning, analyzing, and developing regional transportation system improvements, gaps exists in the areas of operational and traffic flow management activities. Concerns such as signal systems, freeway management systems, and other advanced IVHS user service areas need to be addressed. A cooperative effort, utilizing experts in the subject matter, will provide a regional perspective. The development of a strategic plan will afford this opportunity. A key aspect of the plan will be a comprehensive analysis to determine the institutional framework within which advanced systems are operated and maintained. Development may range from installation of communication links and information sharing, to a more complex solution—creation of a new operating entity.

Comprehensive strategic planning for early IVHS deployment technologies will help guide Maricopa County's rapidly changing transportation system. Maricopa County's evolving transportation system plan will apply national IVHS guidelines for open systems architecture, database system standards, institutional barrier identification, deployment planning, technology transfers, and private/public partnerships. Early deployment of the Strategic Plan will strengthen critical multi-jurisdictional government relations, academic research and development, operational testing, and industry partnerships in Maricopa County. The ultimate goal is to improve the quality of life in Maricopa County by providing safe, efficient, and environmentally sensitive transportation system for residents and visitors.

ADOT, FHWA, MAG, MCDOT, and local jurisdictions will play key roles in the implementation of the new, enabling IVHS technologies. Active partners in this endeavor will also include the major universities in the state—Arizona State University and the University of Arizona. Potential private sector partners in IVHS implementation may include automotive, electronic, defense contractors, and communications companies (e.g., General Motors, Chrysler, Motorola, Allied Signal, Intel, Honeywell, Hughes, McDonnell Douglas, TRW). Several of these locally based, nationally and internationally identified corporations, are recognized for their commitment to IVHS programs.

1. MAGIC--An Advanced Traffic and Traveler Program funded by MAG

MCDOT received Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds in early 1993 from MAG to undertake a feasibility study of implementing Advanced Traffic Management Systems (ATMS) and Advanced Traveller Information Systems (ATIS) in Phoenix metropolitan. The purpose of these systems is to improve efficiency and safety of multi-jurisdictional travel, and to reduce emissions on the arterial streets and the freeway system.

The following agencies and municipalities formed partnerships:

- MCDOT
- ADOT
- FHWA
- Regional Public Transportation Authority (RPTA)

•	Cities of:	Chandler	Paradise Valley	Phoenix
		Gilbert	Mesa	Scottsdale
		Glendale	Peoria	Tempe

JHK & Associates, was selected to perform the study with notice to proceed given on June 1, 1993. The study period is twelve months with the scope of work dividing the study into three phases:

Phase I Feasibility of regional coordination of city traffic signal systems.

Phase II Feasibility of integrating the signal systems with ADOT's FMS.

Phase III Feasibility of developing and interfacing an ATIS with the ATMS.

The study is approximately 50% complete, with Phase I nearly 100% complete. The final selection of three demonstration projects will be included in the regional Transportation Improvement Program (TIP).

Phase I projects focused on:

- Real-time air quality monitoring;
- Various traffic control strategy impacts;
- Application of advanced wireless communications technology to signal system coordination; and
- Application of multi-jurisdictional signal coordination strategies in selected corridors to provide greater benefits to regional traffic flow.

Phase II is underway with the consultant studying regional traffic flow, FMS—signal system integration and signal timing opportunities.

The FMS includes a central control facility and an array of equipment installed along or within the freeway, including:

- Electronic vehicle detectors
- Closed-circuit television cameras
- Variable message signs
- Entrance ramp metering signals
- Bus bypass lanes on entrance ramps

FMS works in several cities across the United States and resulted in an 15%-57% increase in peak period driving speeds; a 37%-45% decrease in travel time; and a 29%-45% reduction in accidents. Additional benefits include less air pollution, lower fuel consumption, reduced vehicle operating expenses, and improved traffic flow.

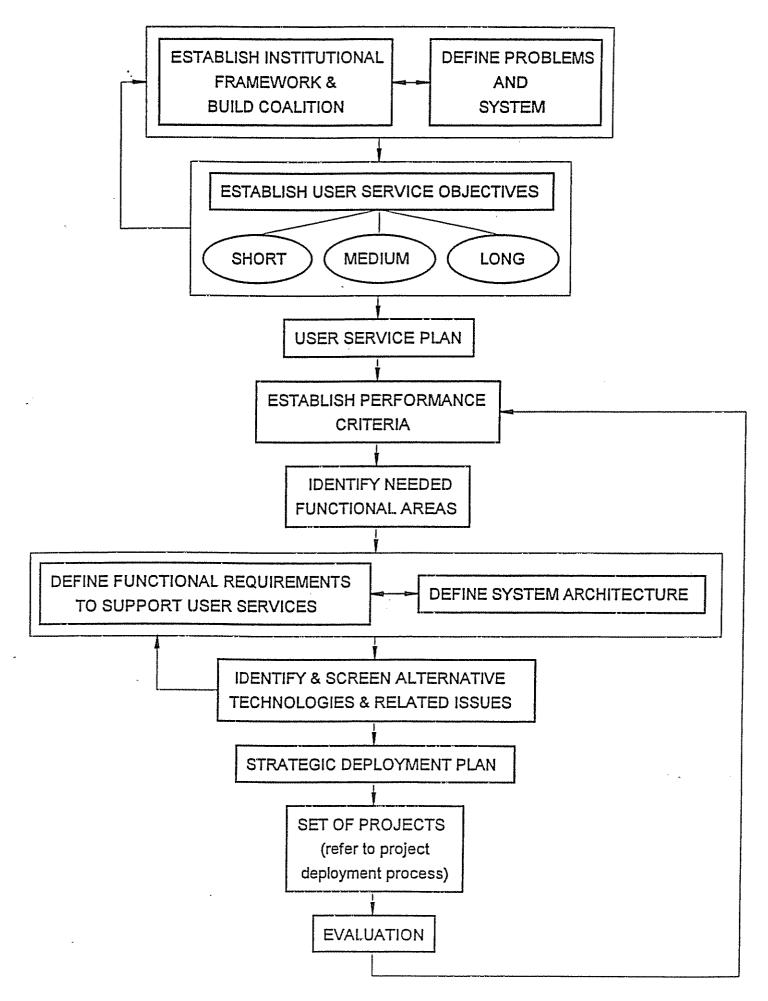
FMS is underway on several fronts. The ADOT Traffic Operation Center (TOC) building is complete and much of the computer system in-place. Over \$12 million in design is complete and design work is progressing on other segments. Currently, ADOT has under construction installation of 29 miles of FMS. The project began March 23, 1993 and will include I-10 from 83rd Avenue to Southern Avenue and I-17 from Thomas Road to the Maricopa traffic interchange. Installations will include TV cameras every mile, ramp meters at nearly all ramps, variable message signs every two miles and loop detectors every 1/3 mile. The contractor is currently placing conduit from the TOC to the I-17/I-10 interchange. Approximately 30 ramp metering sites and six variable message signs are currently operational. All freeway miles had electronic vehicle detectors installed during pavement construction. This project costs \$29 million and is programmed for completion in August, 1995.

4. Phoenix Transit-Bus Card Plus Program

Phoenix Transit is currently involved in several IVHS/APTS applications for transit and is well established in the usage of smart card technology. A program called "Bus Card Plus" has been implemented on all fixed route system buses in the Phoenix Transit fleet. This program utilizes a special debit card that is issued by employers. The system tracks all boardings and bills the appropriate account. Phoenix Transit is also planning a smart card system on all its Dial-a-Ride vehicles using either a debit or value card. This will reduce paperwork and billing data for both the drivers and accounting staff. Phoenix Transit is continuing work on advancing their smart card systems to include usage of credit cards and reducing cash fare inconveniences.

Phoenix Transit also completed a demonstration project on Advanced Vehicle Location (AVL) system technology, utilizing a small fixed route passenger bus. This project tested the effectiveness of voice messages that announced all major street crossing and bus stops along the route. This test has encouraged Phoenix Transit to begin development of another AVL program to track all Dial-a-Ride vehicles and provide scheduling information to drivers via a computer terminal. This system will allow increased Dial-a-Ride efficiency through better route planning and reduced staff time.

IVHS PLANNING PROCESS



TASK 2. Establish user service objectives. (Due week 20)

The consultant shall inventory all coalition members for their respective individual system goals and objectives. Once the inventory is complete, the consultant will match the respective goals with the user service category as defined by FHWA. This inventory should include short, medium, and long range goals and objectives. The identified goals and objectives should be linked to the MAG Regional Council vision and mission to ensure the IVHS Strategic Plan goals and objective are consistent with established regional transportation system goals and objectives. This task shall include, but not be limited to, the following components:

- Define short, medium, and long range time frames.
- Inventory the coalition for system short, medium, and long range needs.
- Match local needs with appropriate IVHS user services.
- Develop objectives to achieve user service goals.
- Prepare for review and acceptance a technical memorandum which documents the work performed under Task 2.

TASK 3. Identify and develop a User Service Plan based on the goals and objectives identified in Task's 1 and 2. (Due week 24)

This plan will document system characteristics, problems, and opportunities as discussed previously. The plan will also discuss user service objectives established to meet the needs of the area-wide system in the short, medium, and long term as discussed above. The User Service Plan will be the basis for further planning and design of the IVHS deployment. This task will include, but not be limited to, the following components:

- Develop a User Service Plan as a stand alone document capable of integration with the Strategic Plan.
- Identify the best user services for early implementation that will achieve success as identified by the coalition.
- Prioritize remaining identified user service objectives based on local need.
- Prepare for review and acceptance a technical memorandum which documents the work performed under Task 3.

TASK 4. Establish Performance Criteria (Due week 28)

In order to determine how successful the plan will be in meeting the identified user service objectives, it is necessary to establish performance system measures. Specific quantitative criteria will depend on the particular user service, but may be based on such performance measures as changes in travel time, fuel consumption, vehicle occupancy, accidents, or transit schedule reliability. A qualitative assessment, like a survey of the attitude of the people who interact with the system (e.g., operations and maintenance personnel, management, the general public, decision makers, etc.), may also be a good

 Enhance existing system operations - Improve information, interagency coordination, and increase productivity of agency staffs. Eliminate crossjurisdictional barriers and delays.

Coordination of traffic management strategies/operations Availability of real-time information

This task shall include, but not be limited to, the following components:

- Define performance criteria for the system from a global perspective.
- Define performance criteria for individual service plan elements.
- Prepare for review and acceptance a technical memorandum which documents the work performed under Task 4.

TASK 5. Identify needed functional areas that support local user services (Due week 32)

FHWA has identified seven functional areas that support user services. Each user service offered by a transportation management system is achieved through the application of various technologies which perform one or more of the following system functions:

Surveillance	Collection of speed, volume, density, travel time, queue length, position, classification, weather, hazardous material (etc.) information for use in providing user services.		
Traveler Interface	Means by which a user interacts with information devices.		
Navigation/Guidance	Systems to assist traveler in route planning, position identification, and route following.		
In-vehicle Sensors	Monitoring of vehicles, driver and external driving environment that pertains to vehicle operations.		
Communications	Transmission of voice, data and video information among vehicles and system infrastructure.		
Control Strategies	Strategies implemented by system to help regulate traffic flow and ensure traveler safety.		
Data Processing	Management integration and quality control of all data and algorithms pertaining to IVHS.		

The consultant shall organize member agency meetings of the coalition and work together to determine what functions the area-wide traffic management system is going to need. It is important to determine what functions will be needed to support the

 Define group resources and required activities and resources to various subsystems.

Identify opportunities for integration, both between coalition members and within

the agencies themselves.

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- Define and incorporate the following elements in the development of an "open" system architecture: functional requirements, logical architecture, and physical architecture.
- Outline functional system requirements in hierarchical order.
- Develop architecture diagrams for the system design.
- Identify where the functions occur (physical architecture).
- Prepare for review and acceptance a technical memorandum which documents the work performed under Task 6.

TASK 7. Identify & screen alternative technologies & related issues (Due week 44)

Alternative technologies should support the functional areas, requirements, and user services. How these technologies affect the preliminary architecture definition developed in the previous step will also be considered. "Related Issues" refers to those items indirectly related to technology considerations such as procurement, standards, operations and maintenance, etc.

The review should be at a level of detail sufficient to allow refinement of potential architectures and identification of possible procurement methods, operations and maintenance strategies, and funding arrangements. This would include hardware, software, personnel, etc.

An economic analysis should take into account the total cost of the system over its assumed life cycle. Initial construction costs, costs relating to operations and maintenance, replacing system components during the life-cycle of the system, system expansion, and other costs should be included with the initial expenses.

Incorporation of standards, where feasible, allows the option of using different vendors for the same service, helps to ensure compatibility with new products and services in the future, and provide compatibility between neighboring traffic operations systems. When planning and designing an area-wide system, there needs to be an awareness of current standards and developing standards, especially those evolving from non-transportation industries.

Incorporating existing components (i.e., computers, controllers, communications cable, changeable message signs, etc.) can save significant amounts of money. An attempt should be made to incorporate existing systems into the new system while allowing for enhancement of the existing system and keeping the concept of an open architecture in mind.

time table for area-wide system implementation. The plan should also identify potential funding sources and suggest procurement approaches for each project.

This task shall include, but not be limited to, the following components:

- Develop the region-wide Strategic Deployment Plan which includes short, medium, and long term components.
- Develop a schedule for the updating of the plan which accounts for the state TIP, county CIP, and local jurisdiction programmed improvements.
- Develop a set of projects for short, medium, and long term implementation which includes costs, scheduling, and contingencies for project implementation based on available funding.
- Prepare for review and acceptance a technical memorandum which documents the work performed under Task 8.
- Prepare for review and acceptance the Strategic Deployment Plan for the Early Deployment of IVHS Technology in Maricopa County.

DELIVERABLES

- 1. Monthly status report to the project manager, coalition members, and FHWA.
- 2. Consultant to schedule and conduct all meetings—minimum of one meeting per month with the coalition.
- 100 copies of the final strategic plan-bound.
- 4. Any technical memoranda should include meeting minutes, technical research, and analysis related to the task.
- 5. One copy of Strategic Plan in Wordperfect 5.1 format and graphics in DXF or GM format.

APPROVAL OF THE MARICOPA COUNTY ATTORNEY

Ι have reviewed the above referenced proposed intergovernmental agreement between the STATE OF ARIZONA, acting through the DEPARTMENT OF TRANSPORTATION and MARICOPA COUNTY, and declare this agreement to be in proper form and within the powers and authority granted to the County under the laws of the State of Arizona.

DATED this 29 day of May, 1994.

County Attorney



STATE OF ARIZONA

OFFICE OF THE ATTORNEY GENERAL

GRANT WOODS
ATTORNEY GENERAL

1275 WEST WASHINGTON, PHOENIX 85007-2926

MAIN PHONE: 542-5025 TELECOPIER: 542-4085

INTERGOVERNMENTAL AGREEMENT DETERMINATION

A. G. Contract No. KR94-1250-TRN, an agreement between public agencies, has been reviewed pursuant to A.R.S. §11-952, as amended, by the undersigned Assistant Attorney General who has determined that it is in the proper form and is within the powers and authority granted to the State of Arizona.

No opinion is expressed as to the authority of the remaining parties, other than the State or its agencies, to enter into said agreement.

DATED this 7th day of September, 1994.

GRANT WOODS

Attorney General

JAMES R. REDPATH

Assistant Attorney General

Transportation Section

JRR:lsr 8577G